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METEOROLOGICAL OFFICE

CLIMATOLOGICAL MEMORANDA NO. 31

LOW TEMPERATURE AND WIND SPEED AT ABERDEEN, ALDERGROVE, BIRMINGHAM, KEW AND SOUTH SHIELDS - COCKLE PARK

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INTRODUCTION

The mean wind speed was calculated for each day that the mean temperature was equal to or below 32.4 or 32.5°F. at Aberdeen, Birmingham, Kew and South Shields -- Cockle Park and the frequency tables of these occasions are given.

DATA

The temperature data used were as below.

For all stations the mean wind speed was obtained by averaging the mean wind speeds for the twenty-four hours 0 - 24 G.M.T. and is given in m.p.h.

Aberdeen Observatory

The temperature data used were for the period October 1922 to March 1947 covering twenty-five winters. The mean temperature was obtained by halving the sum of the daily (0 - 24h G.M.T.) maximum and minimum temperatures read to the nearest tenth of a degree Absolute. The mean was converted into degrees Fahrenheit to the nearest tenth of a degree. The days used in this investigation were those when the mean temperature was 32.4°F. or below.

Aldergrove (Northern Ireland)

The temperature data used were for the period October 1928 to March 1953 covering twenty-five winters. The mean temperature was obtained by halving the sum of the maximum and minimum temperatures read to the nearest whole degree Fahrenheit and credited to the day of entry: from 1928 to 1944 the maximum temperature was read at 18h G.M.T. and the minimum temperature was read at 07h G.M.T: from 1945 these temperatures were read at 21h and 09h G.M.T. respectively. The days used in this investigation were those when the mean temperature was 32.5°F or below.

Birmingham (Edgbaston)

The temperature data used were for the period October 1925 to March 1950 covering twenty-five winters. The mean temperature was obtained by halving the sum of the maximum and minimum temperatures read to the nearest whole degree Fahrenheit and credited to the day of entry: from 1925 to 1944 the maximum temperature was read at 18h G.M.T. and the minimum temperature was read at 07h G.M.T: from 1945 these temperatures were used at 20h and 09h G.M.T. respectively. The days used in this investigation were those when the mean temperature was 32.5°F. or below.

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Kew (London)

The temperature data used were for the period October 1925 to March 1950 covering twenty-five winters. The mean temperature was obtained by halving the sum of the daily (0 - 24h G.M.T.) maximum and minimum temperatures read to the nearest tenth of a degree Absolute. The mean was converted into degrees Fahrenheit to the nearest tenth of a degree Fahrenheit. The days used in this investigation were those when the mean temperature was 32.4°F. or below.

South Shields - Cockle Park

The temperature data here were for Cockle Park (Morpeth) and the wind data were for South Shields since no anemograph records were available for Cockle Park. The data used were for the period October 1925 to March 1950 covering twenty-five winters. The mean temperature was obtained by halving the sum of the maximum and minimum temperatures read to the nearest whole degree Fahrenheit and credited to the day of entry, readings being made at 21h G.M.T. The days used in this investigation were those when the mean temperature was 32.5°F. or below.

RESULTS

Tables 1 - 5 give the occurrence of individual days having mean temperature 32.4 or 32.5°F. or less with various mean temperatures and various mean wind speeds for each month November to March for Aberdeen, Aldergrove, Birmingham, Kew and South Shields - Cockle Park. The ranges of temperature in the tables are 17.6 - 18.4°F., 18.5 - 19.5°F., 19.6 - 20.4°F..... 31.6 - 32.4 or 32.5°F. These ranges are shown in the tables as 18, 19, 20, ...32°F. The ranges of mean daily wind speed in the tables are 0 - 2.4 m.p.h., 2.5 - 5.5 m.p.h., 5.6 - 10.4 m.p.h., 10.5 - 15.5 m.p.h., 15.6 - 20.4 m.p.h.....35.5 - 40.4 m.p.h. The ranges are shown in the tables as 0 - 2, 3 - 5, 6 - 10, 11 - 15, 16 - 20, 21 - 25, 26 - 30, 31 - 35 and 36 - 40 m.p.h. The period for each station(s) is one covering twenty-five winters.

Also shown in these monthly Tables 1 - 5 are the totals of the numbers of cold days (with mean temperature equal to or less than 32.4 or 32.5°F.) for each of the ranges of mean wind speed mentioned above together with the total numbers of cold days with all wind speeds.

Looking at the grand totals for each month it will be seen that the greatest number of days with mean temperature equal to or less than 32.4 or 32.5°F. occurred in January at all stations, the next greatest in February, with December, March and November following in that order.

Looking at the totals for each mean wind speed range it will be seen that in most months at all stations the greatest number of days with mean temperature equal to or less than 32.4 or 32.5°F. occurred when the mean wind for the day was 6 - 10 m.p.h.

The number of cold spells of duration in days of 1 - 2, 3 - 4, 5 - 6, 7 - 8, 9 - 10, 11 - 12 and durations above twelve days occurring in the period covering twenty-five winters are shown in Table 6: each day forming part of the spell had a temperature equal to or less than 32.4 or 32.5°F. The durations mentioned in the table are the maximum durations that is e.g. a spell of 5 - 6 days is counted only as a spell of this length and does not contribute to spells of 1 - 2 or 3 - 4 days. Also shown in this table are the number of spells of duration 3 or more days, 5 or more days and 7 or more days for each station in this period covering twenty-five winters.

Next the spells were classified as of durations 1 - 2 days, 3 - 4 days and 5 days or more and the mean wind computed for each spell. Table 7 shows for each station for each class of spell the percentage frequencies of that class with the mean wind speed in the ranges mentioned in the first paragraph of this section.

Finally an index to represent the cooling power of the air was calculated from Tables 1-5 using the formula:

Cooling index = $\Sigma[(33 - T)V^{1/2}]$

where 33°F. is the standard temperature from which temperature deficits were computed, T is the mean temperature of the day to the nearest whole degree Fahrenheit and V is the mean wind speed during the day.

Using all months November to March for the period covering twenty-five winters the following values were obtained for this cooling index:

Aberdeen	2038
Aldergrove	1725
Birmingham	5011
Kew	2398
Southshields - Cockle Park	4782

This cooling index is least at Aldergrove which is under the influence of a maritime climate associated with that for the Atlantic. The index is greatest for Birmingham which lies a comparatively long distance from the sea and where one might expect a more continental climate than Aldergrove.

Noteworthy is the low value of the index for Aberdeen Observatory whose latitude is 57° 10' N.

TABLE 1. ABERDEEN, OCCASIONS OF COLD DAYS

NOVEMBER

Mean temperature in °F. \ Mean speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	
28			1				
29							
30							
31		1	1				
32		1	1	1			
Total		2	3	1			6

DECEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	
24			1				
25			3				
26							
27			3	1			
28		1				1	
29	1	1	1	1			
30		4	2				
31	1	1	5		1		
32	1		6	1			
Total	3	7	21	3	1	1	36

JANUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	
22		2					
23	1						
24			3	1			
25		1	3				
26	1	1	2	1			
27	1	1	2	4			
28		1	3	1			
29	1	7	3	2			
30	1	6	2	2		1	
31	1	7	2		1		
32		4	8	1	1		
Total	6	30	28	12	2	1	79

TABLE 1 (Continued)

FEBRUARY

Mean temperature in °F.	Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
26				1	1			
27				2		1		
28				2	1			
29			2	7				
30			3	6		1	1	
31			3	4	4		1	
32			1	6	2			
Total			9	28	8	2	2	49

MARCH

Mean temperature in °F.	Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
23				1				
24				2				
25			2					
26								
27				1				
28				1	2	1		
29				3	1	1		
30			3	1	1	1		
31			2	2	1	1	1	
32			1	2	1		1	
Total			8	13	6	4	2	33

TABLE 2. ALDERGROVE. OCCASIONS OF COLD DAYS

NOVEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	
30		2						
31	2		1					
32	3	2			1			
Total	5	4	1		1			11

DECEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	
22			1					
23								
24								
25	1							
26	1							
27	1	1	1					
28	2	2	1	1				
29	1		1	1				
30	1	1	2	1				
31	3	2	4	2				
32		3	1		1		1	
Total	10	9	11	5	1		1	37

JANUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	
20		1						
21	1							
22	1	2						
23	1	2	1					
24	1		1					
25	3	2						
26	1	1	2					
27	2	1	1		1			
28	3	1	3					
29	4	6	2					
30	6	3	6	2	1			
31		4	6	4	1			
32	2	10	9	4	4	1	2	
Total	25	33	31	10	7	1	2	109

TABLE 2 (continued)

FEBRUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	26–30	
27	2							
28		1	2					
29	1		1	3	1			
30	3	3	4	3	2	1		
31	3	2	2	6	1			
32	1	5	8	3	1			
Total	10	11	17	15	5	1		59

MARCH

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	26–30	
26		1						
27				1				
28			1		1			
29	1	2	1					
30			1	1				
31			1	1				
32		4	5	3		3		
Total	1	7	9	6	1	3		27

TABLE 3. BIRMINGHAM (EDGBASTON). OCCASIONS OF COLD DAYS

NOVEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	26–30	
31	2		1		2			
32			2					
Total	2		3		2			7

DECEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	26–30	
23			1					
24	1		1					
25				1	3			
26		2						
27		2	1					
28	1	1	4	1	1	1		
29	1	2	4		2			
30		5	4	4	1			
31		3	10	3	1			
32	1	5	9	4	3	1		
Total	4	20	34	13	11	2		84

JANUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	26–30	
18				1				
19			1	1				
20		1						
21		1		1				
22		2	2	3				
23		1	1	1				
24			4					
25			1					
26		1	6		2			
27		4	5	1				
28	1	3	9	10				
29	2	5	19	6	3			
30	2	7	12	11	2		1	
31	2	8	6	13				
32	2	5	16	12	2			
Total	9	38	82	60	9		1	199

TABLE 3 (continued)

FEBRUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	
19		1						
20			2					
21								
22				1				
23		1						
24		2		2	2			
25				3				
26			4	4	1			
27		1	2	4	1			
28		3	3	2	3			
29		2	8	8	2			
30	1	2	7	2		1		
31	1	2	4	8	2			
32		1	6	6	1	1		
Total	2	15	36	40	12	2		107

MARCH

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	
26			1	1	1			
27			3					
28			1	1	1	1		
29			1	3				
30				3				
31			2	2	1			
32		3	4	4		1		
Total		3	12	14	3	2		34

TABLE 4. KEW (LONDON). OCCASIONS OF COLD DAYS

NOVEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
31		1	2				
32	1						
Total	1	1	2				4

DECEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
24		1		1			
25							
26			1	1		1	
27	4		1				
28		1				1	
29	5	3		1			
30	2	7					
31	1	6	2	1	1		
32	6	5	5	3	1		
Total	18	23	9	7	2	2	61

JANUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
21			1				
22		1					
23			1				
24		1	1	1			
25		1	1				
26		1	4	1			
27	2	5		1	1		
28	2	2			2		
29	3	3	2	3	2		
30	5	3	10	3	1		
31	8	5	11	5	2		
32	2	5	4	8	1	1	
Total	22	27	35	22	9	1	116

TABLE 4 (continued)

FEBRUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
21		3					
22							
23					1		
24							
25	1				1		
26		1		1			
27		2	5	2	1	1	
28				3			
29		1	5	5			
30	1		2	5			
31	4	3	4	5	3		
32	1	6	8	4	2		
Total	7	16	24	25	8	1	81

MARCH

Mean temperature in °F. \ Mean wind speed in m.p.h.	0–2	3–5	6–10	11–15	16–20	21–25	
26			1				
27		1					
28							
29			1	1			
30		1	1				
31			3	1		1	
32		2	3		1		
Total		4	9	2	1	1	17

TABLE 5. SOUTH SHIELDS - COCKLE PARK. OCCASIONS OF COLD DAYS

NOVEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	
27			1							
28				1						
29										
30			2	1						
31		2	3	3						
32		1	3	1	2					
Total		3	9	6	2					20

DECEMBER

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	
25			1	1						
26		1	1	1						
27		2	1	2	1	1				
28		2	5	1		1				
29		1	4	1	3	2	1			
30	1		3	2	1					
31	1	1	8	11			1			
32		4	8	7	4	3				
Total	2	11	31	26	9	7	2			88

JANUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	
20				1						
21					1					
22			1	2						
23	1			1						
24			2	1						
25	1	3	1	2	1					
26		1	3	3		1				
27			5	2						
28		4	4	5	2					
29	2	5	7	2	2					
30	1	8	8	1	1	1				
31	2	3	7	5	7	1	1	1	2	
32		9	12	11	5	1	1			
Total	7	33	50	36	19	4	2	1	2	154

TABLE 5 (continued)

FEBRUARY

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	
20			1							
21		1								
22										
23		1	1							
24		1	1	4						
25					2					
26		1								
27	1	2	2	1	1	2				
28	1		3	1	4	1				
29		2	8	2	1					
30	1	6	8	8	4	4	1			
31		3	6	6	3	3				
32	3	2	10	5	4	2	3	2		
Total	6	19	40	27	19	12	4	2		129

MARCH

Mean temperature in °F. \ Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	
22			1							
23		1		1						
24										
25		1								
26										
27			2							
28			2	1	1					
29		3		1	2		1			
30				2	3	4				
31		3	1	1	7	4				
32	1	1	8	10	7	3				
Total	1	9	14	16	20	11	1			72

TABLE 6. NUMBER OF COLD SPELLS OF VARIOUS MAXIMUM DURATIONS IN PERIOD COVERING TWENTY-FIVE WINTERS.

Length of spell in days	1-2	3-4	5-6	7-8	9-10	11-12	15	20	33	42	3 or more	5 or more	7 or more
ABERDEEN	73	15	5	3	1						24	9	4
ALDERGROVE	99	12	4	1	1			1			19	7	3
BIRMINGHAM	89	30	5	4	4	2			1		46	16	11
KEW	47	16	6	4	3	1	1				31	15	9
SOUTH SHIELDS - COCKLE PARK ..	106	30	12	7	3	1				1	54	24	12

TABLE 7. PERCENTAGE FREQUENCY OF COLD SPELLS OF VARIOUS DURATIONS WITH VARIOUS MEAN WIND SPEEDS.

STATION	Length of spell in days / Mean wind speed in m.p.h.	0-2	3-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
ABERDEEN	1-2	3	41	40	10	5	1			
	3-4		20	47	33					
	5 or more		11	78	11					
ALDERGROVE	1-2	17	30	34	12	5	1			
	3-4	8	50	17	17	8				
	5 or more			71	29					
BIRMINGHAM	1-2	8	16	44	24	6	3			
	3-4		10	40	47	3				
	5 or more			69	25	6				
KEW	1-2	23	43	19	15					
	3-4	6	31	31	13	19				
	5 or more			71	29					
SOUTH SHIELDS COCKLE PARK	1-2	4	14	39	25	11	4	3		
	3-4		7	40	30	20	3			
	5 or more			42	42	15				

N.B. The percentage frequencies in Table 7 are given to the nearest whole figure, and therefore the totals of any row may not be exactly 100.

G.02596/JB/9/61/50.